

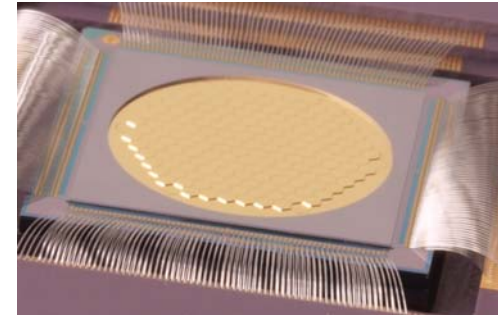
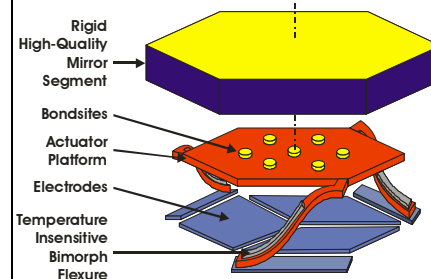
NNX11CE94P - Picometer-Resolution MEMS Segmented DM

PI: Dr. Michael Helmbrecht

Iris AO, Inc., Berkeley, CA

Identification and Significance of Innovation

- DMs used for coronagraphy must be capable of picometer resolution
- MEMS DMs have relatively large surface figure errors in unpowered state
- Fabrication processes must be matured to improve unpowered surface figure
- DM design can be modified to compensate for remaining residual errors while maintaining picometer resolution



Expected TRL Range at the end of Contract (1-9): 3

Technical Objectives and Work Plan

Technical Objectives

- Mitigate chip bow effects that cause deformation in the array
- Eliminate systematic tilts in the mirror arrays
- Mitigate random segment position variations
- Continue to improve DM yield by tracking and codifying fabrication-process defects and failure modes
- Design a picometer resolution 939 actuator, 313-segment DM

Work Plan

- 1) *Chip-bow mitigation*
- 2) *Systematic-tilt elimination and segment-position-variation reduction*
- 3) *313 segment picometer-resolution DM design*

Phase I Results

- 9X reduction in systematic tilts demonstrated
- 9X reduction in dimensional variations demonstrated
- Post-process technique to reduce chip bow demonstrated
- Floor-plan layout of 313-segment DM completed with novel pm-resolution actuators

NASA and Non-NASA Applications

NASA Applications

Visible Nulling Coronagraph for ATL:AST, DAVINCI, and EPIC

Non-NASA Applications

Atmospheric correction
Free-space laser communications
Fiber alignment/coupling for fiber spectragraphs
Laser beam shaping
Retinal imaging
Microscopy

Firm Contacts

Dr. Michael Helmbrecht
michael.helmbrecht@irisao.com
(510) 849-2375

NON-PROPRIETARY DATA